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ABSTRACT

Recent growth in national attention directed toward online courses and virtual schools underscores the importance of e-learning policy and online learning practices. In response to these needs, this edition of "Policy Issues" aims to: summarize the critical e-learning issues related to education policy; provide an overview of what works, based on recent research and program assessment; and offer policy recommendations to support decision makers and policy leaders charged with the investigation and deployment of online courses and Internet-based learning environments in K-12 schools and school districts. Discussion includes online courses and virtual high schools; publications on e-learning policy and practice; definitions that offer points of reference for comparing some of the most important concepts of online learning; e-learning policy implications forK-12 educators and decision makers; America's first public virtual high school, findings from an evaluation of students in the virtual high school's third year that examined students' participation in and satisfaction with online courses; and findings and recommendations from theNorth Central Regional Educational Laboratory (NCREL). (Contains 18 references.) (AEF)

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Issue 11 April 2002

A Research-Based Analysis of Education Issues

IR

About This Issue

Since 1996, enormous progress has been made toward achieving the U.S. Department of Education's goal to build a national technology infrastructure to support its vision for effective technology use in the nation's elementary and secondary schools. Significant increases in federal, state, local, and private investment in the national technology infrastructure have helped many teachers and students in elementary and secondary schools obtain access to and begin using a variety of powerful new online learning tools. These tools enable distance learning and technology-based instructional delivery systems.

Recent growth in national attention directed toward online courses and virtual schools underscores the importance of e-learning policy and online learning practices. In response to these needs, this edition of *Policy Issues* aims to:

- ☐ Summarize the critical e-learning issues related to education policy.
- ☐ Provide an overview of what works, based on recent research and program assessment.
- ☐ Offer policy recommendations to support decision makers and policy leaders charged with the investigation and deployment of online courses and Internet-based learning environments in K-12 schools and school districts.

The full complexity and impact of e-learning and online courses on policy and practice in K-12 schools and school districts is emerging only now as a subject for consideration and discussion by leadership in public education. It is imperative that state-level education policymakers become active participants in the ongoing conversations about K-12 online learning. Such participation will help ensure the systematic implementation of effective e-learning strategies in the nation's elementary and secondary schools.

A Message From Gina Burkhardt, NCREL Executive Director

Welcome *to the April 2002 edition of* Policy Issues*—a research-based analysis of education issues. This edition takes a look at online learning and virtual schools. It also presents the policy and practice implications that can enhance the potential of electronically delivered learning, or* e-learning*, as a viable and effective educational approach.*

E-learning is a powerful instructional strategy because it transcends the boundaries of traditional classroom instruction. In fact, it creates virtual schools that allow learning to occur at the student's initiative—any time, any place. E-learning also holds promise for promoting equity by providing students with access to courses that otherwise might not be available, such as accelerated courses in remote rural areas.

Education leaders and policymakers play an important role in guiding the development of e-learning strategies. Their understanding and involvement is crucial for effective implementation of e-learning and virtual schools for K-12 students.

For additional information on e-learning, visit NCREL's E-Learning Knowledge Base *Web site at* ***www.ncrel.org/tech/elearn/****.*

Virtual Schools and E-Learning in K-12 Environments:

Emerging Policy and Practice

By Robert Blomeyer, NCREL Program Associate

Online learning—also known as *electronically delivered learning* or *e-learning*—is one of the most important and potentially significant new instructional approaches available for supporting the improvement of teaching and learning in America's K-12 schools today. According to a recent report of the National Association of State Boards of Education, "E-learning will improve American education in valuable ways and should be universally implemented as soon as possible" (NASBE, 2001, p. 6).

A growing body of evidence supports the conclusion that when e-learning is deployed with identical attention to the enabling details that characterize high-quality face-to-face instruction, it can effectively complement, enhance, and expand educational options available for K-12 students. In cases where e-learning is appropriately deployed, educators can generally anticipate student academic performance that is at least equivalent to traditional classroom instruction (Cavanaugh, 2001).

Access to online learning systems in public education has shown dramatic growth with support from the Technology Literacy Challenge Fund and the Federal Communications Commission's E-Rate program. According to the most recent report from the National Center for Education Statistics, 98 percent of U.S. public schools were connected to the Internet in fall 2000 (Cattagni & Farris, 2001). Investments in computers, Internet access, technology professional development, technical support, and content development have allowed elementary and secondary teachers and students to experience the benefits of using these powerful new learning technologies.

The deployment and diffusion of online courses in K-12 schools and postsecondary institutions is becoming an almost irresistible force. Accordingly, it is now important to give careful, systematic consideration to details that will have lasting impacts on the U.S. educational system. Such consideration must be given to all aspects of e-learning and online education that may affect the quality, efficiency, equity, and educational choices available to all American students—regardless of age, race, religion, or socioeconomic standing—"any time, any place, any path, any pace" (NASBE, 2001, p. 6).

Online Courses and Virtual High Schools

Internet use in K-12 schools and postsecondary institutions is having a profound impact on the evolution of computer use and the curricular integration of new learning technologies (Valdez et al., 2000). For example:

- A recent Phi Delta Kappa/Gallup Poll survey shows that 35 percent of parents approved of their children earning high school credits online without attending a regular school (Rose & Gallup, 2001).
- Dr. William J. Bennett, U.S. Secretary of Education during the Reagan administration, has gone from criticizing the use of technology in schools to creating his own highly publicized nationwide cyberschool, now open for Grades K-2.

With such broad support and demand, it is not surprising that virtual schools are springing up across the country. (See "America's First Public Virtual High School" on page 5.) Commercial potential is adding momentum to this growth. Virtual schools now exist in more than two-dozen states. Well-established virtual schools in Florida

Definitions to Know

Discussions about online learning and courses delivered over distance may be confusing for readers who are unaccustomed to literature on distance education and technology-based instructional delivery systems. The following definitions offer points of reference for comparing some of the most important concepts of online learning.

- **Distance education:** "Educational situation in which the instructor and students are separated by time, location, or both. Education or training courses are delivered to remote locations via synchronous or asynchronous means of instruction, including written correspondence, text, graphics, audio- and videotape, CD-ROM, online learning, audio- and videoconferencing, interactive TV, and facsimile. Distance learning does not preclude the use of the traditional classroom. The definition of distance education is broader than and entails the definition of e-learning." (Kaplan-Leiserson, 2000)
- **Distance learning:** "The desired outcome of distance education." (Kaplan-Leiserson, 2000)
- **E-learning:** "Covers a wide set of applications and processes such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV, and CD-ROM." (Kaplan-Leiserson, 2000)
- **Virtual school:** "An educational organization that offers K-12 courses through Internet- or Web-based methods." (Clark, 2001, p. 1)

Definitions from Kaplan-Leiserson (2000) are from the *E-Learning Glossary*, available online at http://www.learningcircuits.org/oct2000/oct2000_elearn.html. Copyright © 2000 by the American Society for Training and Development. Reprinted with permission.

and Utah boast student enrollments in the thousands (Clark, 2001).

The advent of e-learning in America's secondary schools means that students in small rural high schools, who might not otherwise have access to Advanced Placement courses, can complete such courses online and gain academic credit at quality institutions of higher education. Availability of online course-equivalent learning environments may mean that an injured and homebound high school senior, unable to attend the one available section of a required class, can fulfill the requirement and graduate with the rest of his or her class. In short, e-learning offers a potentially important resource for providing accelerated courses that otherwise might not be available, filling gaps in required course offerings, increasing graduation rates, and reducing dropout rates.

Publications on E-Learning Policy and Practice

The significance of online courses and virtual schools has been underscored by the release of important recent publications describing the contemporary context for e-learning and detailing the important policy issues concerning use of online courses in the K-12 schools. The first of these publications on e-learning is titled *The Power of the Internet for Learning: Moving from Promise to Practice* (Web-Based Education Commission, 2000). This report examines the promise of the Internet for improving the national education system, with particular attention to equity. It also reports on the significant obstacles blocking fuller utilization of Web-based teaching and learning. Concrete recommendations are given for this purpose. The report is illustrated by a series of case-based examples looking at exemplary uses of Web-based teaching and learning in all types of settings ranging from military training to migrant education, including e-learning applications in K-12 schools.

E-learning can provide both accelerated and required courses, leading to increased graduation rates and reduced dropout rates.

At about the same time that the Web-Based Education Commission was completing its report, the U.S. Department of Education was releasing the revised National Educational Technology Plan titled *E-Learning: Putting a World Class Education at the Fingertips of All Children* (Office of Educational Technology, 2000). This document uses the term *e-learning* in a context broader than recent references that are more limited to online courses and virtual schools. It proposes and elaborates the following National Educational Technology Goals:

Goal 1: "All students and teachers will have access to information technology in their classrooms, schools, communities, and homes."

Goal 2: "All teachers will use technology effectively to help students achieve high academic standards."

Goal 3: "All students will have technology and information literacy skills."

Goal 4: "Research and evaluation will improve the next generation of technology applications for teaching and learning."

Goal 5: "Digital content and networked applications will transform teaching and learning." (Office of Educational Technology, 2000, p. 4)

Although online courses and virtual high schools are discussed in some detail in the body of the plan, it seems clear that the emphasis of the plan is broadly concerned with supporting high-quality curriculum content and improved student academic achievement. In fact, the motto of one of the models for technology integration prominently featured in the plan summarizes the general position of the National Educational Technology Plan: "It's not about technology. It's about *learning*" (Office of Educational Technology, 2000, p. 14).

Most recently, the National Association of State Boards of Education has released a significant new report titled *Any Time, Any Place, Any Path, Any Pace: Taking the Lead on E-Learning Policy* (NASBE, 2001). The use of the term *e-learning* in this report focuses entirely on virtual courses and virtual schools. This emphasis is illustrated in the report's Executive Summary, which makes the case that the available evidence convincingly demonstrates that electronically delivered courses and virtual schools "can improve how students learn, can improve what students learn, and can deliver high-quality learning opportunities to all children" (NASBE, 2000, p. 4).

E-Learning Policy Implications for K-12 Educators and Decision Makers

Start-Up Costs

The history of the development and dissemination of computer-aided learning (CAL) or computer-assisted instruction (CAI) deployed in the K-12 schools during the last 40 years suggests that that the development and production of online learning technologies is an expensive and labor-intensive proposition for both schools and teachers.

For classroom teachers, the amount of time required to develop and implement high-quality online learning environments (including thorough curriculum research and systematic design, implementation, and testing of evaluation prototypes) amounts to a serious opportunity cost for the supporting school that often is overlooked by school administrators.

Consider this classical formula for estimating the amount of time required to develop a single contact hour of computer-assisted instruction:

"Estimates for the development of materials range from 50 to 150 person-hours of development time to one hour of instruction. This range is usually true in the development of computer-assisted instructional materials, filmed materials, and tape materials using a systematic model that includes an assessment of the problem as well as an evaluation and revision of the materials until they reach the specified instructional objectives. It may take, however, as many as 2,000 hours to develop one hour of instruction" (Knirk & Gustafson, 1986, p. 187).

Experience has shown that unless teacher-technologists who pioneer the integration of new learning technologies in curriculum (either via screening and selection or local development of applications) are provided appropriate release time and other support apparently required for high-quality learning outcomes, the resulting materials may be ineffective. Materials developed under such conditions "were tried as alternatives and proved to be time-consuming, expensive, and inefficient" (Blomeyer, 1991, p. 146).

From the teacher-technologist's perspective, whether online learning is developed and implemented by commercial publishers and professional software developers or developed locally by the most innovative and talented K-12 master teachers, it is certain that quality e-learning can become available in the public schools only if public education is willing to invest in the front-end costs.

The specific costs of e-learning may be expressed in terms of the replacement value for substitute time (needed to support a teacher-technologist and release him or her from instructional duties), in terms of the per-pupil costs for licensing a commercial e-learning product, or in terms of reimbursement paid to another school or district in exchange for use of online courses developed by teachers in other local districts. A recent survey shows the most reported tuition for virtual high school courses is $300 per semester, but prices seem to vary greatly (Clark, 2001). In short, both the costs and the benefits of online courses can be substantial.

Evidence of Impact

Although a growing body of research, program evaluation, theory, and policy documents the rapid introduction of e-learning in postsecondary institutions in the United States and around the world, research documenting and examining e-learning in K-12 settings has begun to be published just in the last few years. Publications examining the effectiveness of e-learning will be particularly significant for both teachers and school administrators.

Currently, there appears to be only a small body of educational research examining the instructional effectiveness of online learning. A meta-analysis of findings on the effectiveness of K-12 distance learning delivered via both online and two-way voice/video systems by Cavanaugh (2001) provides an overview of educational research conducted between 1993 and 1997. Cavanaugh analyzes the effects sizes of selected quantitative educational research examining student academic achievement as a result of using distance education in K-12 settings. Her findings indicate that distance-learning projects characterized by online telecommunications (or e-learning), distance learning to supplement and support more traditional classroom instruction, smaller sized groups, and shorter-duration learning

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America's First Public Virtual High School

The Virtual High School® is a consortium of high schools offering online courses taught and designed by cooperating teachers who are accredited in their respective states. VHS® online courses, called NetCourses™, provide students in participating schools with online access to advanced, technical, and specialized courses that often are unavailable in smaller high schools with limited course offerings (Kozma et al., 2000).

The Virtual High School originally was called the Concord Virtual High School. It was started in 1996 with an award of a five-year, $7.5 million Technology Innovation Challenge Grant to the Hudson (Massachusetts) Public Schools and the Concord Consortium, a nonprofit educational research and development company. Online classes were first offered during the 1997-98 school year (Kozma et al, 2000). At that time, the Concord Virtual High School offered 30 online courses to about 500 students in 27 schools in 10 states (National Association of State Boards of Education, 2001). Since that time, it has expanded greatly. The school, now called simply the Virtual High School, currently is operated by VHS Inc. as a not-for-profit corporation; during the 2000-01 school year, the school offered 155 courses to 3,000 students in 170 schools (Clark, 2001).

VHS students connect Web servers using browsers to access the instructional resources required to complete online assignments. Documents available on the VHS Web site include syllabi, course readings, and all supplementary course materials (such as graphics, audio files and videos); all are easily accessible via the World Wide Web. The NetCourses are delivered from external servers that provide 24-hour support seven days a week to ensure consistent delivery of VHS services.

In the NetCourses, students work independently or collaboratively on assignments, thereby providing scheduling flexibility that permits individuals and collaborative groups to schedule group sessions and complete assignments in a timely and deliberate manner. Teachers are able to monitor student progress via the Web site; they also provide periodic feedback to students and issue grade reports from within the course Web site on the Virtual High School's co-located servers.

The Virtual High School permits participating secondary schools to offer their extended online courses anywhere, anytime, and at low cost via the Web. Supporters believe that online courses allow students more one-on-one contact with teachers than traditional face-to-face instruction, because student are not competing for attention with other students in their classes. Supporters also believe that VHS courses "foster independent learning, hone computer literacy skills, and provide interaction with students from diverse cultural backgrounds, as well as level the playing field for minorities, low-income students, and those in low-income areas" (Hayes, 2001, p. B11).

In October 2001, the five-year U.S. Department of Education grant supporting the Virtual High School expired. VHS now charges an annual membership fee of $6,000 per participating high school; this fee allows each participating school to enroll 20 students in VHS courses during the fall and spring semesters (Clark, 2001).

The transition from financing VHS operations through U.S. Department of Education start-up funding to becoming a not-for-profit company financed almost entirely by payment for services may mean the loss of some participating VHS Consortium members. Schools unwilling or unable to pay higher annual fees for access to VHS online courses will have to look elsewhere, build their own courses, or abandon the use of online learning as a local curricular alternative.

In time, the approximately 44 other state and locally organized virtual high schools that have followed the lead of the VHS also may exhaust the initial grants or other funding sources that have subsidized their development and initial operations. Nearly all of the major virtual high school projects eventually may be forced to enter the more competitive fee-for-services arena.

As this foreseeable transition to market-driven financial status becomes a reality for more and more virtual high school projects, those with broader organizational support and geographic participation will have a significant marketing advantage. In fact, offering high-quality online courses to large enrollments over a wide geographic radius may enable competitive marketing of online courses on economies of scale.

Federal, state, or private investments to offset the high costs of online course development will not last forever. When the start-up support is gone, public and private developers of online courses that can offer the highest quality content—in the most interactive and best managed online learning environments—will become the virtual schools that survive.

E-Learning in the Real World:

Findings on Student Participation, Satisfaction, and Learning

The Virtual High School® (see "America's First Public Virtual High School" on page 5) is the oldest and best-documented virtual high school in the United States. An evaluation of the Virtual High School's third year, conducted by SRI International (Kozma et al., 2000), examined VHS® students' participation in and satisfaction with online courses. An online student survey was administered to all students participating in selected online courses and to students in face-to-face classes serving as control groups in identical locations. The following findings from the student surveys were reported:

- "Comparing the VHS and face-to-face groups, VHS students were more likely to be 11th graders, and face-to-face students were more likely to be 12th graders."
- "VHS students were more likely to be enrolled in six or more courses than were face-to-face students. Consequently, their VHS courses were often taken on top of a full course schedule."
- "Students in both groups expressed interest in and enjoyment of their courses."
- "VHS students were likely to agree that their VHS courses were of high quality and required hard work, but face-to-face students were more likely to agree strongly with these statements about their courses."
- "VHS students were more likely than face-to-face students to use the World Wide Web, but there were no significant differences between the groups in their other computer, e-mail, or general Internet use."
- "There were no reported differences between the two groups in the use of computers to do research projects or write reports as part of their course work."
- "Face-to-face students were likely to agree strongly that discussion was a regular part of their courses, that they frequently communicated with other students, and that communications with other students were an important part of their learning. VHS students were likely to disagree with all of these statements."
- "There were no significant differences between the two groups in the reported frequency with which they communicated with their teachers. On the other hand, face-to-face students were more likely than VHS students to agree strongly that communications with teachers were an important part of their learning and that they got their assignment grades back from their teachers in a timely manner." (Kozma, et al., 2000, iv-v)

In addition to the student surveys, the SRI evaluation considered teacher assessment of students' performance on two types of measures: teacher-developed key assignments and Internet research skills. Key assignments included an important test and a paper or project selected by the respective teachers. These assignments were selected from available choices in the respective online and face-to-face courses in the cooperating schools.

According to the SRI evaluation, the analysis of student assessments indicates that the participants in the VHS online courses apparently had learning experiences that were similar in many ways to students in parallel face-to-face courses. In portions of the courses that were common to both online and face-to-face sections, VHS sections had nearly identical goals and objectives, structure, content, and assignments as the parallel face-to-face sections of the same classes.

Face-to-face and VHS courses were taught by matched pairs of similarly experienced, high-quality instructors. There were no apparent differences in the grades awarded to the students in two out of three parallel courses. More students in the VHS course sections passed a "technology use" portion of the required Internet assessment; in addition, "many more" VHS students than face-to-face students passed all the skill areas of the Internet assessment (Kozma et al., 2000, p. v). In only one course and in one skill area (reasoning with information), did face-to-face students significantly outperform VHS students.

Conclusions about similarities and differences between the parallel VHS and face-to-face courses showed "there were few student dropouts from either. Face-to-face and VHS students received similar grades in the two types of course. In addition, VHS students acquired the technology-based reasoning and communication skills needed for the 21st century information society" (Kozma et al., 2000, v).

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experiences show consistently bigger effects sizes than projects using two-way videoconferencing, primary instruction via distance, long duration, and larger sized groups.

It is tempting to generalize from Cavanaugh's findings and jump to the conclusion that fully online courses may result in lower academic achievement than hybrid courses (which combine more traditional face-to-face instructional strategies with online learning). However, because student achievement data from fully online, virtual high school courses was not available for consideration in Cavanaugh's meta-analysis, implications for academic achievement in contemporary virtual high schools would be inappropriate at this time.

Applying Cavanaugh's findings to conclusions about contemporary e-learning would require replication of her meta-analysis to include all qualifying research available since 1998. Until then, educators and policy leaders may wish to examine related conclusions from online learning research in corporate training, higher education, and international education.

Policy Context

At the CiTE Virtual High School Symposium, sponsored by the Center for Internet Technology in Education and held in October 2001, there was ample evidence that a vigorous and growing community of practice is building what could be called a virtual high school movement. This enthusiastic and active group of first comers exhibited many of the characteristics attributed to successful virtual communities.

In his keynote address at this symposium, John Bailey, currently director of the Office of Instructional Technology for the U.S. Department of Education, shared his views on education and technology and described the conditions required to achieve positive outcomes from e-learning in K-12 schools. He mentioned the following policy themes for online learning:

- "Anywhere, anytime" learning means that "education can now be delivered to students wherever they are located."
- Online learning should encourage schools to become "education centers" for their respective communities.
- "Every educational program is a technology opportunity, and every technology program is an educational opportunity."
- Online assessment in conjunction with online learning has the potential to significantly increase the effective use of instructional time and encourage "a system of education that isn't based on mass production, but is instead based on mass customization."
- "We need to be relentless in measuring and assessing the impact that technology has on education and on academic achievement. We need evidence that teaching and learning are improved as the result of technology. Using technology to teach using traditional methods will only lead to traditional results." (Bailey, 2001)

Dialogues and conversations among attendees at the symposium centered around creating a consensus between practitioners and commercial developers of online learning products about the critical issues facing the online learning community. It was not apparent, however, that state-level policymakers or representatives from education agencies in the states developing virtual schools took part in these important discussions.

NASBE (2000) concurs that there is a lack of input from education leaders and policymakers with regard to e-learning development and implementation: "The uncomfortable reality is that education leaders are not currently driving the policy agenda" (p. 6).

It is imperative that state-level education policymakers become active participants in ongoing conversations about K-12 online learning. Without the substantial participation of state-level educational leadership, any possible contribution of online learning technologies or e-learning to school improvement and reform may fall prey to the loose coupling that is apparent between many traditional state educational policies and visionary e-learning practice.

Findings and Recommendations

In the end, student access to online courses will be determined by local decisions that must be made by education administrators and policy leaders everywhere. These decisions will affect whether or not specific virtual courses will be approved (or afforded) for individual students who have particular rationales and reasons for requesting enrollment in online classes. In some cases, this situation may contribute to lower enrollment in regularly offered on-site classes, lower daily attendance, and shrinking instructional loads—with negative impacts for staffing and personnel budgets.

The following findings and recommendations offer some next steps for state and local policymakers and education leaders.

Finding 1:

Innovative technology leaders in the e-learning movement and established state education policy leaders have not established a basis for communication and dialogue on critical policy issues relating to K-12 online learning.

Recommendations:

- ☐ Leaders in the e-learning movement and state education policymakers should initiate communications and begin working together to help shape e-learning practice. Such dialogue will help education policy leaders understand the unique dimensions of e-learning practice and also will enable e-learning to operate within critical education policy constraints.
- ☐ Key state education agency representatives should be encouraged to participate in professional forums, such as subsequent CiTE Virtual High School Symposiums. These forums provide common ground for critical dialogues between e-learning consumers, producers, and educational policy leaders concerned with the top-to-bottom articulation of e-learning policy and practice.
- ☐ State education agencies should be strongly encouraged to begin a thorough analysis of existing state education policies that have clear implications for support and regulation of online learning or e-learning in K-12 environments. In all cases, due consideration should be given to modifying or adapting existing policies to promote the equitable diffusion and implementation of online learning. The time-consuming development of new policies, in contrast, may delay or slow the adoption and effective implementation of K-12 online learning.

Finding 2:

When provided with quality professional development opportunities and supervised online clinical experience, good traditional teachers also can become effective facilitators of online learning. Similarly, well-qualified and experienced online instructors can learn the more specialized instructional design and implementation skills that are necessary to create quality online learning materials based on their existing teaching experience and curricular expertise.

Recommendations:

- ☐ Certified, experienced teachers who wish to become online instructors should be required to complete an approved professional development curriculum ensuring their competency as online instructors before being assigned responsibility for leadership in an online course.
- ☐ Experienced online instructors should be required to complete appropriate specialized professional development concerned with the design and implementation of online learning environments before undertaking the local development of online courses.
- ☐ Specialized professional development programs that provide teachers with professionally recognized credentialing as online instructors or developers of online learning often are costly and time consuming. Professional development costs for teachers should be shared or fully reimbursed, work release time should be provided to support preparation required before and during initial online instructional assignments, and teaching loads should be appropriately adjusted to compensate for online teaching or participation in online instructional development projects.
- ☐ School districts should avoid encouraging or requiring teachers to accept assignments as online instructors. They should not require teachers and other district employees to participate in the development of online instructional materials or course materials without appropriate financial compensation for assigned duties and due respect for copyright and ownership of intellectual property (see American Association of University Professors, n.d.).

Finding 3:

Hybrid courses (combining face-to-face and online instruction) with smaller enrollments and clear linkages to approved curriculum practice seem to offer higher completion rates and arguably better quality learning outcomes than online courses alone (Cavanaugh, 2001). This finding suggests that online learning optimally should be used in some combination with face-to-face instruction, primarily from qualified and experienced teachers who are in physical proximity to enrolled online students.

Recommendation:

- ☐ School districts, state education agencies, and the U.S. Department of Education should collaborate on

the development and implementation of a scientific research agenda related to the use of online professional development and e-learning with students in K-12 learning environments. This agenda should determine which resource configurations and instructional design practices optimize student achievement and authentic learning outcomes.

Finding 4:

Optimal resource configurations and instructional design practices that promote effective e-learning outcomes in K-12 learning environments currently are not recognized, generally understood, or agreed upon by e-learning producers, consumers, and education policy leaders. Objective, research-based guidelines and standards supporting the selection and screening of online courses are lacking. When seeking product information on online tools and advice about what works and what doesn't in K-12 e-learning environments, school districts and state education agencies may be dependent solely upon the vested interests that are developing and selling online learning services and technologies.

Recommendation:

- ☐ All concerned parties and agencies should support the development and diffusion of standards and assessment guidelines for online learning. Such standards and guidelines can assist local school districts and state education agencies with the selection and acquisition of well-designed and effective online learning.

Finding 5:

Existing educational research and program evaluations that examine and analyze the outcomes and impact of online learning in K-12 learning environments presently are very limited. The few research summaries and meta-analyses currently available do not include published data from recent program evaluations and assessments from state and federally supported virtual high school programs.

NCREL's Research on Virtual Learning Issues and Priorities

At NCREL, research on virtual learning has been guided by an evolving list of issues we believe to be important influences on the introduction of online learning to K-12 learning environments. The research documenting these issues comes from NCREL's work with secondary teachers and technology coordinators in Minnesota Intermediate District 287 and the Minnesota Department of Children, Families, and Learning (see NCREL, 2001).

Examination of the issues subdivides them into two categories: issues that are relevant to curriculum and teaching practice, and issues that are relevant to consideration of statewide e-learning policy or policy development.

E-Learning Priorities for Teaching and Learning:

- ☐ Professional development
- ☐ Constructivist teaching practice
- ☐ Philosophy guiding online learning programs
- ☐ Best practices (national, state, local)
- ☐ Quality assurance (for content of online learning materials)
- ☐ Technology equity (access, usage, availability)

E-Learning Priorities for Policy:

- ☐ Funding, funding formulas, funding sources, funding strategies
- ☐ Costs and benefits; return on investment
- ☐ Quality and equity of online learning opportunities
- ☐ Accountability and assessment
- ☐ State or district planning, coordination, support, and evaluation
- ☐ Teacher certification and licensure

Note: These themes from NCREL's e-learning assessment in Minnesota are comparable to critical priorities from the available literature describing e-learning policy and practice in higher education (see King et al., 2000; Southern Regional Education Board, 2001).

Recommendations:

- ☐ Existing research summaries and meta-analyses concerned with e-learning policy and practice should be expanded to include newly published findings on recent state and regional virtual high school projects.
- ☐ Support for additional professionally designed and executed program evaluations and scientific educational research should be given a high priority in all public and private agencies supporting effective implementation and use of online learning in K-12 learning communities.

Conclusion

In final analysis, e-learning isn't about digital technologies any more than classroom teaching is about chalkboards. E-learning is about people and about using technology systems to support constructive social interactions, including human learning. Although computers and other digital technologies clearly will play an increasing role in K-12 schools, e-learning may work best when it is combined with some face-to-face classroom experience. In the best of all possible worlds, an eventual goal might be for students to have their own notebook computers to support both in-school and at-home learning, as long as they actively pursue other publicly available educational opportunities.

Educational technologies are an increasingly important part of the nation's efforts to broadly and substantially improve the quality, efficiency, and equity of student learning. The Office of Educational Technology (2000) states:

"The leadership imperative is clear. Collectively, these new goals for technology in education represent an updated, high-level strategy for ensuring the future of education in which all students will benefit from the enhanced learning opportunities afforded by new and emerging communications and information technologies" (p. 7).

Books and traditional strategies certainly will continue to be important, along with technologies such as telephones, satellites, computers, interactive TV, CD-ROMs, the Internet, compressed videos, audiotapes, and videotapes. But in all probability, today's newest educational technology approaches—e-learning and virtual schools—are destined to become tomorrow's established instructional delivery systems. New e-learning technologies will become increasingly common for people in all walks of life and increasingly integrated as an invisible and ubiquitous part of U.S. global, cultural, political, and economic systems.

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NCREL's Online Resource for E-Learning

As a response to the growing interest in e-learning, North Central Regional Educational Laboratory (NCREL) has developed the *E-Learning Knowledge Base* Web site. This Web site provides a review and synthesis of current literature on e-learning. It is available at **www.ncrel.org/tech/elearn/**.

The foundation of the *E-Learning Knowledge Base* is a searchable, annotated review of literature containing more than 350 active links to full-text sources. These online resources vary in scope and complexity from single, article-length publications published in a growing number of high-quality online publications to complex Web sites that house content roughly equivalent to a published journal or book. It appears that because of the unique nature of work in e-learning, the best literature may very well be available in online forms.

Besides the online review of literature, the *E-Learning Knowledge Base* contains narratives connecting e-learning with curriculum and standards-based content, teaching and learning, instructional technology systems, and cultural and organizational context. Informing K-12 leaders and decision makers on the full range of issues concerning development and deployment of e-learning is considered a critical priority. Educators can apply this knowledge to support e-learning strategies and online collaborative environments in the classroom and in professional development activities.

Users can explore the resources in the Web site using any order or strategy that helps them address their questions about e-learning policy and practice. Because e-learning is changing rapidly, the site will be changing with it. New resources will be added periodically. The preliminary conclusions offered by NCREL's synthesis may change as important new studies and policy documents are released for publication. Users are encouraged to come back often to check for new resources and modifications.

E-Learning and Virtual Schools

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